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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/774,099	02/06/2004	Hung-Eil Kim	H1647	8365
45305 7590 12/27/2007 RENNER, OTTO, BOISSELLE & SKLAR, LLP (AMDS) 1621 EUCLID AVE - 19TH FLOOR CLEVELAND, OH 44115-2191			EXAMINER RUGGLES, JOHN S	
			ART UNIT	PAPER NUMBER
			1795	
			MAIL DATE	DELIVERY MODE
			12/27/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/774,099	Applicant(s) KIM, HUNG-EIL	
	Examiner John Ruggles	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 June 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) none is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☒ Claim(s) 13 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Art Unit: 1795

DETAILED ACTION

Response to Substitute (Supplemental) Appeal Brief

Claims 1-15 still remain pending under consideration as last amended on 2/9/07 (in the 2/9/07 supplemental after final (AF) amendment that was entered to simplify issues for appeal).


However, upon further consideration in view of the supplemental appeal brief filed on 6/12/07, PROSECUTION IS HEREBY REOPENED. New grounds of rejection are set forth below.

To avoid abandonment of the application, Appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) initiate a new appeal by filing a notice of appeal under 37 CFR 41.31 followed by an appeal brief under 37 CFR 41.37. The previously paid notice of appeal fee and appeal brief fee can be applied to the new appeal. If, however, the appeal fees set forth in 37 CFR 41.20 have been increased since they were previously paid, then appellant must pay the difference between the increased fees and the amount previously paid.

A Supervisory Patent Examiner (SPE) has approved of reopening prosecution by signing below:


MARK E. HUFF
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700

The previous objections to the specification are maintained and the previous rejections of the claims under the second paragraph of 35 USC 112 are revised below, as necessitated by the

Art Unit: 1795

previously entered 2/9/07 supplemental AF amendment (which only addressed a portion of the previous 35 USC 112 second paragraph rejections). Furthermore, a new objection of claim 13 is presented in this Office action.

The former grounds of rejection over previously cited art reference(s) are replaced by new grounds of rejection that incorporate new prior art reference(s), as set forth below.

This is a non-final Office action for reopening prosecution in the instant application after the filing of a supplemental appeal brief, so Appellant must exercise one of the two options identified above as either (1) or (2) in order to avoid abandonment of this application.

Specification

The abstract of the disclosure is objected to because it is not written in the proper language, which should be amended as follows: --A method of fabricating a photomask having a pellicle on a photomask substrate ~~is disclosed. The method that~~ facilitates accurate measurement of a critical dimension on the photomask ~~critical dimension~~, without requiring [[the]] removal of the pellicle from the photomask substrate. A first pattern is transferred onto [[a]] the photomask substrate in a first area[[,]] and at least one test pattern is transferred onto the photomask substrate outside of the first area. [[A]] The pellicle is attached to the photomask substrate[[,]] ~~and the pellicle to cover~~ [[s]] the first area, but does not cover the at least one test pattern.--. Correction is still required. See MPEP § 608.01(b).

35 U.S.C. 112, first paragraph, requires the specification to be written in "full, clear, concise, and exact terms." The specification is replete with terms, which are not clear, concise and exact. The specification should be revised carefully in order to comply with 35 U.S.C. 112, first paragraph. Examples of some unclear, inexact or verbose terms used in the specification

Art Unit: 1795

are: (1) at page 1 line 7 (p1/L7), "without removing a pellicle" should be changed to --without removing a pellicle from the mask--; (2) at p1/L20, "A pellicle is a thin (~1 um) polymer film" should be corrected to --[[A]] The pellicle is a thin (~1 [[um]] um) polymer film-- (in which the unit --um-- represents "micrometer"); and (3) at p2/L4, "the electron beam and other machines" should be changed (to e.g., --[[the]] an electron beam machine and other machines--, etc.). Note that due to the number of errors, those listed here are merely *examples* of the corrections needed and do *not* represent an exhaustive list thereof.

Appropriate correction is still required. An amendment filed making all appropriate corrections must be accompanied by a statement that the amendment contains no new matter and also by a brief description specifically pointing out which portion of the original specification provides support for each of these corrections.

Claim Objections

Claim 13 is objected to because of at least the following informality: in claim 13 line 3, "substrate which" should be corrected as --~~substrate which~~ substrate, which--. Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 5-6 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter, which applicant regards as the invention.

In claim 5 lines 1-4, the language “wherein forming the first pattern and forming the at least one test pattern include forming the first pattern and the at least one test pattern substantially simultaneously on the substrate” is unclear about whether “substantially simultaneously” means that these steps are performed (A) at the same time (in accordance with page 5 line 2 of the specification) or (B) are conducted so that they overlap in time. Nevertheless for the purpose of this Office action (as in previous Office actions), this language is interpreted to mean --wherein forming the first pattern and forming the at least one test pattern include forming both the first pattern and the at least one test pattern ~~substantially simultaneously~~ on the substrate at the same time-- (in accordance with the original specification and (A) above). It is also understood from the specification at p5/L29 to p6/L18 that these patterns are fabricated by forming an opaque layer on the substrate, patterning a resist thereon, then selectively etching by either a wet or dry etchant of the opaque layer through the resist pattern (as is conventionally known) to produce the first mask pattern and the at least one test pattern on the substrate.

In claim 6 lines 1-4, the text “wherein forming the first pattern and forming the at least one test pattern include forming the first pattern and the at least one test pattern under substantially the same conditions” is repetitive and unclear with regard to the extent or degree of similarity between the conditions under which the first pattern and those under which the at least one test pattern are formed on the photomask. For the purpose of this Office action, this text is interpreted in accordance with p5/L2-3 of the original specification to mean --wherein forming the first pattern and forming the at least one test pattern ~~include forming the first pattern and the at least one test pattern~~ occur under ~~substantially~~ the same or similar conditions--.

Claim Rejections - 35 USC § 102 or 103

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 7, and 11-12 are rejected under 35 U.S.C. 102(b) as being anticipated by Hasegawa et al. (US 2002/0081501).

Hasegawa et al. teach photomasks (or masks) and methods of manufacturing or fabricating them (title, [0003]). Figure 17 is a so-called A-mask (having a transparent field (face) portion with a dark body 17b for phase shifting (PS, e.g., of halftone or attenuating material, etc., [0066] lines 34-35) in an integrated circuit pattern area 17a on a glass plate GP, [0093] lines 1-6) and Figure 18 is a so-called B-mask (having a dark field portion surrounded by a circumference (glass face) on a glass plate GP, [0095] lines 1-7). In these drawings, 17a is a circuit pattern area centrally located inside a pellicle frame 17h, each 17b is a (first) circuit pattern, 17c is a wafer alignment mark transferred onto a semiconductor wafer, 17d is a reticle alignment mark, 17e is a mask discrimination bar code mark (e.g., for mask management or identification, etc.), 17f is a discrimination mark, 17g is a base line adjustment mark or pattern,

Art Unit: 1795

17i is a critical dimension (CD) monitor pattern (emphasis added), 17j is a pattern displacement monitor pattern, 17k is a registration monitor (for measuring alignment shift between patterns of different material), 17 l is another alignment mark (for mask writing), and 17m is a phase difference and fading rate measurement pattern ([0093]). In each of Figures 17 and 18, the reticle alignment mark 17d, the mask discrimination bar code mark 17e, the discrimination mark 17f, and the base line adjustment mark 17g are each test patterns specifically shown as being positioned on the mask outside the pellicle frame 17h (so at least these test patterns are not covered by the pellicle attached by pellicle frame 17h to the mask substrate). However, Hasegawa et al. specifically acknowledge that it is not necessary to set the critical dimension (CD) monitor pattern 17i, the pattern displacement monitor pattern 17j, the registration monitor pattern 17k, the alignment mark for mask writing 17 l, and the phase-difference and fading-rate measurement pattern 17m inside of the pellicle frame (on the mask), but **it is allowed to set them (including the CD monitor 17i) outside of the pellicle frame on the mask** ([0093] lines 33-38, emphasis added). Thus, it is known to cover a first main pattern in a first central area on a mask with a pellicle, wherein the pellicle does **not** cover at least one test pattern (such as a CD monitor test pattern) that is placed outside of the first central area on a peripheral region of the mask. At least the CD monitor pattern 17i is expected to enable the mask to facilitate accurate measurement of a CD on the mask (*instant claim 7*). The methods of making such masks may include forming opaque patterns 1b and mark patterns 1mr on a transparent quartz substrate as illustrated in Figures 2A-2C ([0068]-[0069]) or the mask can include patterned halftone (attenuating) PS material 33-2 on a transparent plate (e.g., quartz, etc.) 33-1, wherein some patterns are covered inside the pellicle 33-5 and other patterns (e.g., for testing, etc.) are not

Art Unit: 1795

covered by the pellicle as shown by Figure 33 ([0066]). A normal binary chrome-on-quartz mask (or chrome-on-glass mask) is fabricated by patterning a resist layer on a chrome (Cr) layer on a transparent quartz glass plate or substrate and then dry or wet etching of the Cr layer through the resist layer ([0003], [0064] lines 1-3, *instant claims 1 and 11*). Alternatively, the mask can be fabricated as an alternating phase shift mask (alt-PSM) as exemplified in Figure 32 or a halftone phase shift mask (HPSM or att-PSM) as exemplified in Figure 33 ([0066], *instant claim 12*). Figure 33 also suggests that the central (first circuit) pattern(s) covered by the pellicle and the peripheral (test) pattern (such as the CD monitor pattern) placed outside the pellicle can be made from the same halftone or attenuating material 33-2, which is reasonably expected to be suitable for use under the same or similar conditions. Figure 22 illustrates mask fabrication steps that include formation of patterns (for circuits and testing) in a patterned layer on a mask blank or substrate, inspection of these patterns, setting or attaching a pellicle on the patterned mask, and then further overall inspection of the finished mask [0104]-[0105]. It is desirable and even necessary to shorten processing time (TAT, turn-around-time) for making patterned masks that result in reduced cost and shortened TAT for patterning corresponding semiconductor devices (including large scale integrated (LSI) circuits, [0002], [0004]) by using such patterned masks.

Claims 2-4, 8-10, and 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hasegawa et al. (US 2002/0081501) in view of Hickman (US 6,812,999) and Tu et al. (US 6,311,319).

While teaching various features of the instant claims as set forth above, Hasegawa et al. do not specifically teach: *[1]* duplicating a portion of the first pattern to derive the at least one test pattern (*instant claims 2 and 8*) *[2]* that includes optical proximity correction (OPC) of the at

Art Unit: 1795

least one test pattern by using shapes selected from serifs, hammerheads, or scattering bars (*instant claims 3-4 and 9-10*); nor [3] that in the method of monitoring a CD pattern on the mask with an attached pellicle, the at least one test pattern critical dimension (CD) is uncovered by the pellicle attached to the mask, the at least one test pattern CD is similar in magnitude to the first pattern CD on the mask (*instant claim 13*) and that the at least one test pattern includes patterns typical of the first pattern on the mask (*instant claims 14-15*).

Hickman teaches methods of correcting exposure defects (title). In reference to the Figure 4 flow chart, it is well known in the art that as resolution increases (on a mask or reticle) finer and more detailed measurements are needed. When desired, resolution may be selectively increased to improve accuracy of an optical correction. For fine reticle regions (e.g., having smaller CDs, etc.), the resolution of measurement may be selectively increased. The type of measurements may vary to accommodate various regions on the same reticle 130 (c5/L3,26-31). A pellicle 140 on the mask may be designed to have corrective properties (c4/L16-19).

Tu et al. teach a minimized cost methodology involving a variety of optical proximity corrections (OPC's) for solving line end shortening and corner rounding problems (title, abstract, c2/L53-55). Mask OPC takes two principal forms; scatter (scattering) bars and serifs, the latter category including hammerheads. A serif is a small square that is added to the corner, or vertex, of a stripe or line on the mask. Vertices may be positive or negative, corresponding to whether they are convex or concave. A positive serif extends the boundaries of a positive vertex while a negative serif reduces the boundaries of a negative vertex. A hammerhead may be viewed as the fusion of two serifs, located on adjacent vertices (c1/L41-52, *instant claims 3-4 and 9-10*).

Art Unit: 1795

It would have been obvious to one of ordinary skill in the art at the time of the invention in the masks and methods of fabricating them, as well as monitoring or measuring of mask CD's taught by Hasegawa et al. (as described above) to compensate for exposure pattern defects that would otherwise result from finer resolution mask regions having smaller CD's by utilizing a methodology involving a variety of OPC's (including e.g., serifs, hammerheads, scattering bars, etc. as taught by Hickman and Tu et al.), because this OPC methodology for finer resolution mask pattern regions minimizes cost while solving line end shortening and corner rounding optical proximity problems in the patterns, including CD's, formed from such masks (as taught by Tu et al. [2]). In order for an at least one test pattern (e.g., a CD monitor or other test pattern, etc.) placed outside of a pellicle attached over a first (circuit or main) pattern on a mask to provide representative estimated CD or other test information about the pellicle covered first (circuit or main) pattern (e.g., CD, etc.), the at least one test pattern CD would necessarily have to be either similar in magnitude to (*instant claim 13*) and preferably derived or even duplicated from a portion of the first pattern CD (*instant claims 2 and 8, [1]*), including incorporation of applicable OPC's from the first pattern CD into the at least one test pattern CD and ensuring that the at least one test pattern includes patterns typical of the first pattern. This is because one of ordinary skill in the art would reasonably expect these applicable OPC's in the at least one test pattern (e.g., CD monitor, etc.) to allow sufficient resolution of the included patterns typical of the first pattern in order to permit accurate representation or estimation of the first pattern (including the first pattern CD) covered by the pellicle on the mask, during monitoring and measuring of the at least one test pattern (including the at least one test pattern CD) placed outside of the pellicle attached to the mask [3].

Art Unit: 1795

Claims 5-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hasegawa et al. (US 2002/0081501) in view of Tanaka et al. (US 2002/0102477).

While teaching various features of the instant claims as set forth above (including forming the first (circuit) pattern (in a central region covered by the pellicle) and at least one test pattern (such as a CD monitor pattern in a peripheral region outside the pellicle) using the same material layer on the mask before attaching the pellicle to the mask substrate), Hasegawa et al. do not specifically teach forming both the first (circuit) pattern and the at least one test pattern on the mask: *[4]* at the same time (*instant claim 5*) or *[5]* under the same or similar conditions (*instant claim 6*).

Tanaka et al. teach masks and methods of making them (abstract, [0004]). In Figure 1 (mask A having an attenuating material surface) and Figure 2 (mask B having a transparent glass surface [0069]), GP is a glass plate substrate, PA is a circuit pattern area centrally located inside a pellicle frame 1g, each 1a is a (first) circuit pattern, 1b a wafer alignment mark transferred onto a semiconductor wafer, 1c a reticle alignment mark, 1d a bar code (mark for discrimination) for mask management, 1e a discrimination mark for mask discrimination, 1f a base line adjustment pattern which corrects aging of focusing and position alignment, 1h a critical dimension (CD) monitor pattern, 1i a pattern displacement monitor pattern, 1j a phase angle monitor mark of a half-tone phase shift mask, and 1k another base line adjustment pattern ([0070]). In each of Figures 1 and 2, the reticle alignment marks 1c, the bar code pattern 1d, the discrimination mark 1e, and the base line adjustment patterns 1f and 1k are all test patterns positioned on the mask outside the pellicle frame 1g (so at least these test patterns are not covered by the pellicle attached by pellicle frame 1g to the mask substrate). At least the CD monitor pattern 1h is

Art Unit: 1795

expected to enable the mask to facilitate accurate measurement of a CD on the mask. The methods of making such masks include steps for fabricating attenuating patterns as illustrated in Figures 3A-3B ([0072], [0075]). Generally, a binary chrome-on-glass mask can be fabricated by patterning a resist layer on a chrome (Cr) layer on a quartz glass plate or substrate and then etching the Cr layer through the resist layer ([0004]). Alternatively, the mask can be fabricated as a halftone phase shift mask (PSM, [0091]-[0092]). The first circuit pattern(s) 1a as well as the test patterns 1c, 1d, 1e, 1k (similar to 1f), 1h, 1i, and 1j are all made of the same attenuating material ([0018], [0070]) and would therefore be reasonably expected to be suitable for use under the same or similar conditions (which suggests to one of ordinary skill in the art that CD monitor patterns 1h would be suitable for unprotected placement outside the pellicle frame 1g on the mask, just like most of the other test patterns 1c, 1d, 1e, and 1k (similar to 1f) that are placed unprotected outside the pellicle frame 1g). It is desirable and even necessary to shorten processing time (TAT, turn-around-time) for making patterned masks that result in reduced cost and shortened TAT for patterning corresponding semiconductor devices (including large scale integrated (LSI) circuits, [0002], [0006]) by using such patterned masks.

It would have been obvious to one of ordinary skill in the art at the time of the invention in the masks so that each mask has a first circuit pattern covered by a pellicle attached to the mask and at least one test pattern such as a CD monitor not covered by the pellicle on the mask, along with corresponding methods of fabricating these masks (as taught by Hasegawa et al.) to form the first circuit pattern and the at least one test pattern on the mask at the same time under the same or similar conditions, because it is known to make the first circuit pattern and the at least one test pattern from the same material (or layer) on the mask (as taught by Tanaka et al.).

Art Unit: 1795

This is also because forming the first circuit pattern and the at least one test pattern at the same time under the same or similar conditions would reasonably be expected to shorten processing time (TAT, turn-around-time) for making patterned masks that result in reduced cost and shortened TAT for patterning the corresponding semiconductor devices (including large scale integrated (LSI) circuits) by using such patterned masks (this motivation is expressed by both Hasegawa et al. and Tanaka et al. as indicated above, [4], [5]).

Response to Arguments

The previous art rejections are withdrawn and replaced by new art rejections incorporating a newly cited reference by Hasegawa et al., which are presented above.

Appellant's arguments with respect to claims 1-15 have been considered, but they are moot in view of the revised and new ground(s) of objection and rejection set forth in this Office action.

This is a non-final Office action for reopening prosecution in the instant application after the filing of a supplemental appeal brief, so Appellant must respond by exercising one of the two options identified above as either (1) or (2) in order to avoid abandonment of this application.

Conclusion

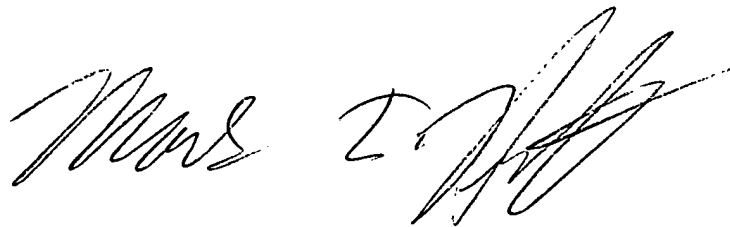
Any inquiry concerning this communication or earlier communications from the examiner should be directed to John Ruggles whose telephone number is 571-272-1390. The examiner can normally be reached on Monday-Thursday and alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1795

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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